

REMARKS

This Amendment and Response to Non-Final Office Action is being submitted in response to the non-final Office Action mailed August 4, 2005. Claims 1-39 are pending in the Application. Claims 1-39 stand rejected. Specifically, Claims 1-26 and 29-39 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Dragone (US 6,542,655) in view of Yoshifuji (US 5,917,426). Claims 27 and 28 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Dragone in view of Yoshifuji, and further in view of Arzt (US 6,087,958).

In response to these rejections, Claims 1, 2, 16, 18, 19, 29, and 34 have been amended to clarify the subject matter which Applicants regard as the invention. These amendments are fully supported in the Specification, Drawings, and Claims of the Application and no new matter has been added. As a result of the amendments, and in view of the following remarks, Applicants submit that the Application is now in condition for allowance and respectfully request such action.

Rejection of Claims 1-26 and 29-39 Under 35 U.S.C. 103(a) - Dragone and Yoshifuji:

Claims 1-26 and 29-39 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Dragone (US 6,542,655) in view of Yoshifuji (US 5,917,426).

In response to this rejection, independent Claims 1, 16, and 29 have been amended to recite, in relevant part, that the switch element of the present invention is logically modeled for control purposes (the resulting logical model being mapped back to the switch element), the set of ingress devices modeled as one or more logical ingress devices, the set of center stage devices modeled as one or more logical center stage devices, and the set of egress devices modeled as one or more logical egress devices. These amendments are fully supported at pages 8-11 of the Specification, which state:

[U]se of a control algorithm is avoided by properly modeling the various devices in a switch element. An example of such a model is illustrated in FIG. 1A and FIG. 1B. ***Such a model enables selective rearrangement of connections across the switch element to be achieved in an efficient manner.*** As shown in FIG. 1A and 1B, a physical three stage Clos network switch element 600 (such as that shown in FIG. 6) can be modeled as a five stage logical switch element 100. In the logical model 100, the middle three stages form a Clos network. The first and last stages, the sorters 115, 125, allow switching across a subset of the routers 116, 126. The routers 116, 126 are the ingress and egress stages of the logical 3-stage Clos network.

Set forth below is the relationship between the physical switch element 600 and the logical model 100 of the switch element.

A model for a physical ingress switch 610 is formed by decomposing the physical ingress switch into a logical ingress device 110 comprising multiple routers 116 interconnected to one or more sorters 115, as shown in FIG 1A. Likewise, a model for a physical egress switch 630 is formed by decomposing the physical egress switch into a logical egress device 120 comprising multiple routers 126 interconnected to one or more sorters 125, as shown in FIG 1B. In one embodiment, a sorter 115, 125 is responsible for selecting a time slot, and a router 116, 126 is responsible for selecting a center stage device 130 to which the time slot is to be switched or from which the time slot is to be received.

A physical center stage switch 620 is modeled as a logical center stage device 130 by expanding the number of edges and reducing the number of time slots per edge. For example, if a physical center stage switch 620 has 32 physical edges and 16 time slots per edge, then the logical center stage device 130 would have 32 x 16 or 512 edges with one time slot per edge. Thus, the logical center stage device 130 is able to accommodate the same aggregate bandwidth as the physical center stage switch 620, but just uses a flattened index.

In one embodiment each router 116, 126 is connected to an edge of each logical center stage device 130. This means that the size of each router 116, 126 is equal to the number of logical center stage devices 130. Thus, if there are K center stage devices 130, then each router 116, 126 has a size of K (i.e., can send or receive K time slots at a time).

Assuming the symmetrical relationship where the aggregate bandwidth on the ingress side is assumed to be equal to the aggregate bandwidth on the egress side the following equation may be used to illustrate that a center stage device 130 can switch the same aggregate bandwidth as a physical center stage switch 620:

$$NLC = E * NEPC$$

where:

NLC = Number Inputs Logical Center Stage = Number Outputs Logical Center Stage,

NEPC = Number of edges in physical Center Stage Switch, and

E = the bandwidth on each edge of a physical center stage switch, assuming the ingress and egress bandwidths are the same.

A model such as that described above is an isomorphism of the physical switch element 600. Descriptions provided in this application may incorporate aspects of this model, but other models may also be implemented and contemplated under embodiments of the invention, using similar principles disclosed herein.

This model enables many benefits to be realized. ***As will be described in greater detail below, the model enables faster response to switching events to be achieved. In addition, it realizes this benefit without needing over-provisioned bandwidth.*** Over provisioned bandwidth is the bandwidth over and above necessary bandwidth to support point to point connections.

C. Switch Configuration

This section further describes the logical model of the switch element, according to an embodiment of the invention. As stated previously, the logical model of the switch element is an isomorphism of the physical switch element.

FIGS. 1A and 1B illustrate a logical model of a switch element 100. In a model such as that shown by FIG. 1, components of switch element 100 include a set of ingress devices 110, a set of center stage devices 130, and a set of egress devices 120. As will be described, the logical model provides that the components of switch element 100 can be separated into 5-stages. The 5-stages include input sorters 115, ingress routers 116, center stage devices 130, egress routers 126, and output sorters 125. ***This logical model can be mapped back to a physical switch element (such as the Clos network shown in FIG. 6) to implement a switch element capable of performing fast rearrangements.*** Software or other logic can be used to implement the logical model on the components of a physical switch element.

Neither Dragone nor Yoshifuji disclose, teach, or suggest a switch element that is logically modeled for control purposes (the resulting logical model being mapped back to the switch element), the set of ingress devices modeled as one or more logical ingress devices, the set of center stage devices modeled as one or more logical center stage devices, and the set of egress devices modeled as one or more logical egress devices. As stated at pages 7-8 of the Specification

[C]onventional switch elements typically use control algorithms, such as Paul's algorithm and the Looping algorithm, to establish initial configurations for the switch element. Conventional switch elements also use these control algorithms to reconfigure the switch element after a switching event is detected. Such algorithms are computationally intensive and can be intermittently unpredictable in temporal length to compute. As such, use of these algorithms for purpose of performing rearrangements of switches with existing connections can result in unacceptable delays.

Therefore, Applicants submit that the rejection of Claims 1-26 and 29-39 under 35 U.S.C. 103(a) as being unpatentable over Dragone in view of Yoshifuji has now been overcome and respectfully request that this rejection be withdrawn.

Rejection of Claims 27 and 28 Under 35 U.S.C. 103(a) – Dragone, Yoshifuji, and Arzt:

Claims 27 and 28 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Dragone in view of Yoshifuji, and further in view of Arzt (US 6,087,958).

Because Claims 27 and 28 are dependent from independent Claims 16, the above arguments apply with equal force here.

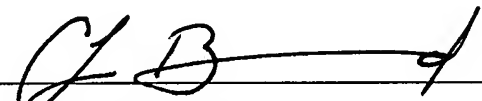
Therefore, Applicants submit that the rejection of Claims 27 and 28 under 35 U.S.C. 103(a) as being unpatentable over Dragone in view of Yoshifuji, and further in view of Arzt, has now been overcome and respectfully request that this rejection be withdrawn.

CONCLUSION

Applicants would like to thank Examiner for the attention and consideration accorded the present Application. Should Examiner determine that any further action is necessary to place the Application in condition for allowance, Examiner is encouraged to contact undersigned Counsel at the telephone number, facsimile number, address, or email address provided below. It is not believed that any fees for additional claims, extensions of time, or the like are required beyond those that may otherwise be indicated in the documents accompanying this paper. However, if such additional fees are required, Examiner is encouraged to notify undersigned Counsel at Examiner's earliest convenience.

Respectfully submitted,

Date: November 4, 2005



Christopher L. Bernard
Registration No.: 48,234
Attorney for Applicants

DOUGHERTY | CLEMENTS
1901 Roxborough Road, Suite 300
Charlotte, NC 28211 USA
Telephone: 704.790.3600
Facsimile: 704.366.9744
cbernard@worldpatents.com